

962,734.

A. W. BENNIS.  
CHAIN GRATE FURNACE.  
APPLICATION FILED JULY 27, 1906.

Patented June 28, 1910.

2 SHEETS—SHEET 1.

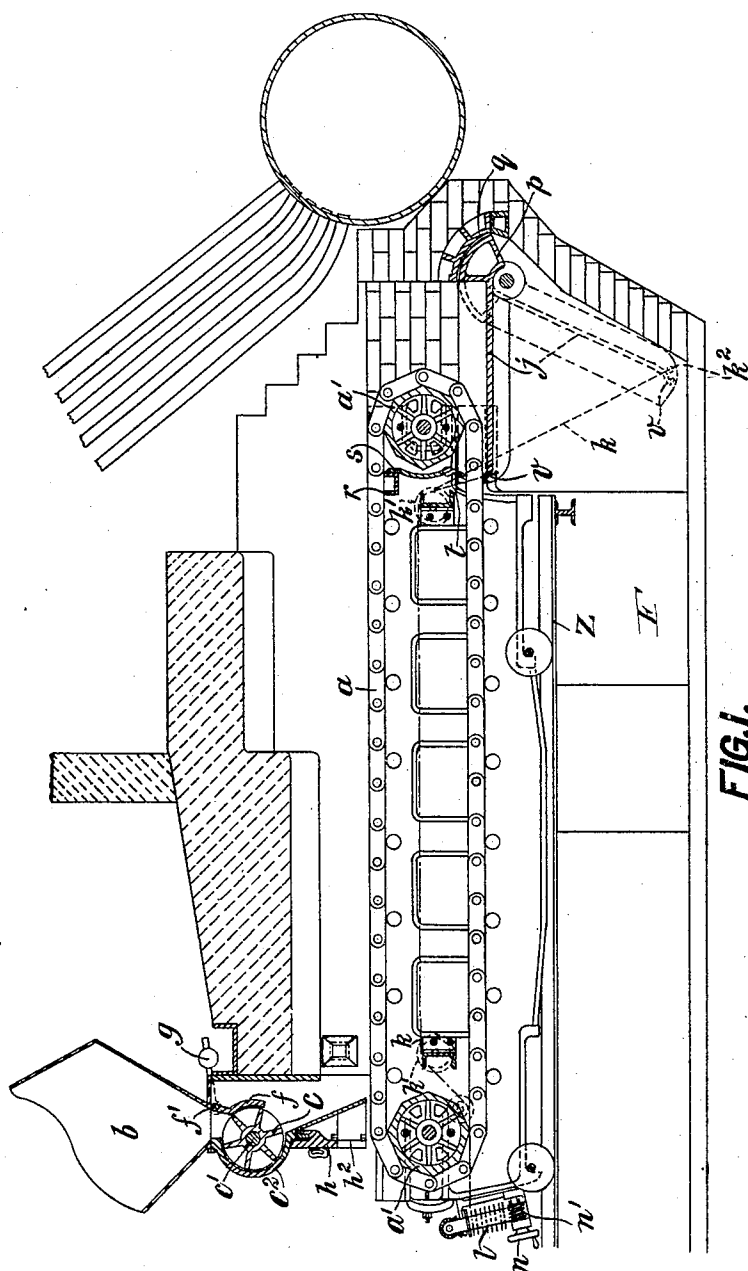


FIG. 1.

Witnesses  
J. H. Rice.  
Fannie Hile

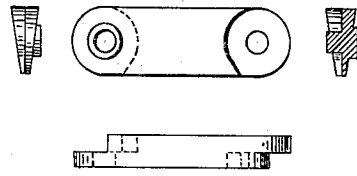
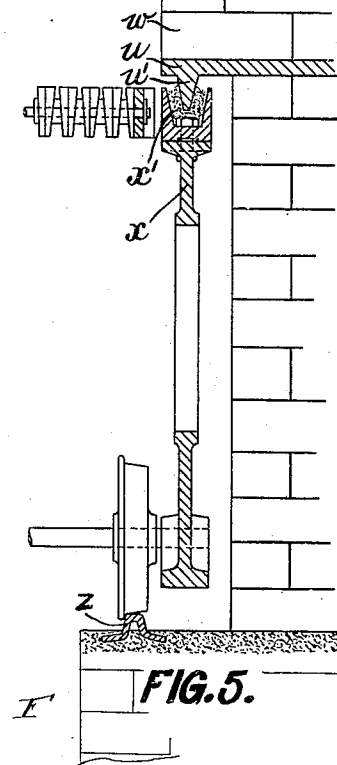
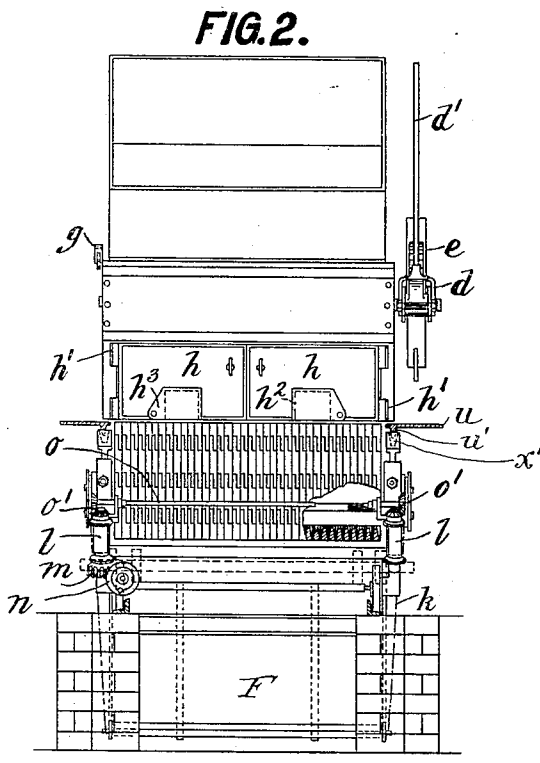
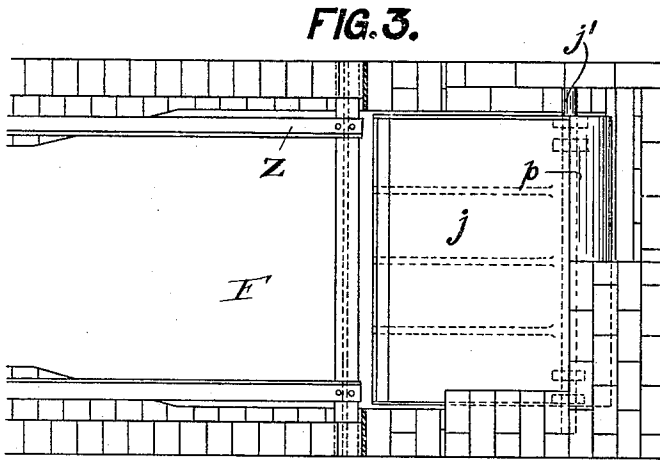
Inventor:  
Alfred W. Bennis,  
by Dodge and Sons,  
Associate Atty.

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2 SHEETS—SHEET 2.



**FIG. 4.**

Witnesses  
*Stewart Rice*  
*Fannie Rice*

Inventor  
*Alfred W. Bennis*  
by *Dodge and Sons*,  
Associate Attys.

# UNITED STATES PATENT OFFICE.

ALFRED W. BENNIS, OF LITTLE HULTON, ENGLAND.

## CHAIN-GRATE FURNACE.

962,734.

Specification of Letters Patent. Patented June 28, 1910.

Application filed July 27, 1906. Serial No. 328,054.

To all whom it may concern:

Be it known that I, ALFRED WILLIAM BENNIS, engineer, a subject of the King of Great Britain, residing in Little Hulton, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful Improvements in and Connected With Chain-Grate Furnaces, of which the following is a specification.

This invention relates to improvements in chain grate furnaces, and has for its object to provide a simpler and more efficacious arrangement than has hitherto been the case. In chain grates at present constructed, it has always been found necessary to employ a dumping bar or bridge at the end of the grate, while the feed of the fuel has been regulated by means of a sliding door, the height of which controls the amount of fuel passing from the usual hopper to the grate.

In order that the improvements which form the subject matter of the present invention may be more fully understood, reference will now be had to the accompanying drawings, in which,

Figure 1 is a sectional elevation of the furnace; Fig. 2, an end view, with a portion of the grate broken away; Fig. 3 is a plan view of the hinged ash chamber floor and the ash-pit; while Fig. 4 shows several details of the chain forming the grate; Fig. 5 is an enlarged view of the device forming the side air seal.

In these, *a* is the revolving chain with the links rounded at their ends as in Fig. 4, or otherwise so formed that on the chain passing around the drums *a'* no appreciable gaps are formed between the individual links and the links do not unduly project the one from the other in this position.

*b* is the usual hopper for feeding the fuel to the furnace.

*c* is a revolving spider mounted on a shaft *c'* and in a casing *c''*, in which the shaft *c'* is journaled. This spider is revolved by means of a spur wheel or ratchet *e* acted upon by any suitable pawl mechanism *d* which can be arranged to engage varying numbers of teeth on the ratchet *e* according to the number of turns it is desired to give to the spider per minute. The pawl mechanism *d* is operated from any suitable reciprocating rod *d'*.

*f* is a depending curved plate hinged at *f'* and counterweighted at *g* so arranged in connection with the spider as to prevent coal other than that which enters into the compartments of the spider from passing to the grate, but capable of swinging away from the spider somewhat to enable any large lumps to pass to the grate.

*h* represents the doors of the furnace hinged to the furnace front at *h'*. These doors *h* are provided with spy-holes *h''* normally covered by hinged slides *h'''*. Toward the back of the grate the usual dumping bar or dumping bridge is dispensed with, and in its place a hinged ash chamber floor *j* is provided hinged to the masonry of the furnace at *j'*. To the forward end of this ash chamber floor are secured chains *k* which pass over suitable pulleys *k'* to winches *l* arranged on the front of the furnace. One of these winches *l* is provided with a spur wheel *m* operated from a hand wheel *n* through a worm *n'*. This winch *l* is connected with the winch on the other side of the furnace by a shaft *o* and bevel gearing *o'*, so that both of the winches will be operated together from the one hand wheel *n*. The chains *k* are removably secured to the ash chamber floor *j* at *k''*. This ash chamber floor *j* projects at its outer end somewhat under the back roller *a'* of the grate, and is provided with a lip *v* at its outer end, which in the normal position of the ash chamber floor presses up or just touches the revolving grate. On the ash chamber floor, and on the other side of its pivotal point *j'* is arranged a curved plate *p* which slides along or contiguous to a fixed plate *q* in the masonry of the furnace so as to practically form an air seal.

Toward the back of the furnace is arranged a channel-iron ash seal *r* to which is secured a plate *s* carrying a hinged depending lip *t* which rests on the chains of the furnace vertically above the lip *v* of the ash floor when the latter is in its raised position. This arrangement forms a very effective air seal and prevents air getting to the back of the furnace.

*u* represents the girder or sill-plate on which the brickwork *w* of the furnace is built. The girder is provided with a downwardly projecting rib or lip *u'*.

*x* represents the framework or casting on

which the usual rollers for the grate are journaled. On this framework on each side is a trough  $x'$  for the rib to dip into. When this trough is filled with ashes a further and  
 5 very effective air seal is formed for the sides of the grate.

F represents the ash-pit and  $z$  the rails upon which the grate can be pulled in and out.

10 The operation of the device is as follows: Fuel is fed in at the hopper  $b$  and allowed to pass in regulated quantities past the spider  $c$  on to the grate  $a$ . The fuel as it is carried along by the grate  $a$  is consumed,  
 15 and at the end of the grate passes in the form of ashes and clinker on to the hinged ash chamber floor  $j$ . The ash at the same time will be deposited in the ash seal  $r$  and also against the lip  $v$  of the hinged ash  
 20 chamber floor so as to form air seals for the back of the furnace while ash in the troughs  $x'$  form air seals for the sides of the furnace. This prevents admission of  
 25 air between the sill plates  $u$  on which brickwork is built and the chain grate frame, minimizing the burning away of the sill  
 30 plates through local rapid combustion. When the floor  $j$  is sufficiently loaded with ash and clinker, it is lowered by turning  
 the hand wheel  $n$  so as to allow the chains  $k$  to wind off the winches  $l$ . When the ashes have been removed the reverse operation is  
 gone through.

If it be desired to increase the feed of  
 35 fuel to the furnace, the spider  $c$  is speeded up by causing the pawl device  $d$  to engage more teeth on the ratchet  $e$  on each reciprocation of the rod  $d'$ . When it is desired  
 40 to withdraw the grate from the furnace the chains  $k$  are disconnected from the floor  $j$  and secured to any suitable part of the grate, and the latter pulled out in ordinary manner.

I declare that what I claim is:—

45 1. In a furnace, a revolving chain grate; a hinged imperforate ash-chamber floor with its outer end extending under the lower straight run of the grate; and means for  
 50 positively holding one edge of said floor up against the under side of said chain grate; thereby forming an ash air-seal between the floor and the under side of said chain grate.

2. In a furnace, a longitudinal chain grate; a hinged imperforate ash-chamber  
 55 floor, the outer end of which projects under the under side of the lower straight run of said chain grate; and means for positively holding the outer end of said ash-chamber floor against the under side of said grate,  
 60 whereby the ashes may collect upon the floor and thus provide a seal.

3. In a furnace, the combination with a chain grate built up of links formed with rounded ends; of a hinged ash-chamber

floor, the outer end of which in its raised 65 position lies under the under side of the lower run of said revolving grate; thereby forming an ash air-seal between the outer end of said ash-chamber floor and said chain grate; a transverse plate between the two 70 runs of said revolving chain grate; and a depending hinged lip on said transverse plate, said hinged lip normally lying on the upper side of the lower run of said chain grate.

4. In a furnace, a chain grate; a hinged 75 ash-chamber floor; a lip on the outer end of said ash-chamber floor; means for bringing said lip up against the under side of the lower run of said chain grate; a transverse 80 plate between the two runs of said chain grate; a hinged depending lip on said transverse plate, the lower edge of which is located on the upper side of the lower run of said chain grate immediately above the lip on the ash-chamber floor; and a transverse 85 ash-seal secured to the upper part of said transverse plate and located on the under side of the upper run of said chain grate.

5. In a furnace, a revolving chain grate; a hinged ash-chamber floor; a lip on the 90 outer end of said ash-chamber floor normally held against the under side of the lower run of said chain grate; flexible connections secured to said ash-chamber floor; and means for taking in and paying out said 95 flexible connections.

6. In a furnace, a revolving chain grate; a hinged ash-chamber floor; means for forming an ash-seal between the outer end of said ash-chamber floor and the under side 100 of the lower run of said chain grate; means for raising and lowering said ash-chamber floor; a transverse ash air-seal for the under side of the upper run of said chain grate; a transverse plate depending therefrom; and 105 a hinged depending lip secured to said transverse plate, said hinged lip being located on the upper side of the lower run of said chain grate immediately above the seal formed at the outer end of said ash-chamber 110 floor.

7. In a furnace, a revolving chain grate; a hinged ash-chamber floor adapted when in its raised position to coact with the under run of said grate so as to form an air ash 115 seal; masonry forming the ends and sides of said furnace; an air-seal between said hinged ash-chamber floor and masonry; troughs on the sides of said chain grate adapted to receive ash from the chain grate; and depend- 120 ing lips secured to said masonry at the sides of the furnace, said lips normally lying in the ash which passes into the troughs.

8. The combination of walls forming a furnace-chamber; a carriage movable in the 125 furnace-chamber; a chain-grate mounted on the carriage; longitudinal members carried by the carriage and forming troughs at the

sides of the grate to receive ash therefrom;  
depending flanges carried by said walls and  
entering said troughs; and a hinged ash  
chamber floor adapted to receive and dis-  
charge ashes from the grate and to prevent  
the passage of air behind the grate.

In witness whereof, I have hereunto

signed my name this 12th day of July 1906,  
in the presence of two subscribing witnesses.

ALFRED W. BENNIS.

Witnesses:

RICH. CASTLE,

ARTHUR W. SMITH.